UNCLASSIFIED

Data Science at Scale School Speaker Series

Anne Berres
TU Kaiserslautern

Adaptive Particle Relaxation for Time Surfaces

Wednesday, October 1, 2014

9:30 - 10:20AM

TA-3, Bldg. 200, Room 116 (ACL Conference Room)

Abstract: In the first part of my talk, I will present a joint project with UC Davis on time surface advection.
Time surfaces are a versatile tool to visualize advection and deformation in flow fields. Due to complex flow behaviors involving stretching, shearing, and folding, straightforward mesh-based representations of these surfaces tend to develop artifacts and degenerate quickly. Common counter-measures rely on refinement and adaptive insertion of new flow particles into the surface representation. This leads to an unpredictable increase in memory requirements and has a strong impact on parallel surface extraction techniques. I will present a novel time surface extraction technique that keeps the number of required flow particles constant, while providing a high level of fidelity and enabling straightforward load balancing. The presented solution implements a 2D particle relaxation procedure that makes use of local surface metric tensors to model surface deformations. This is combined with an accurate bicubic surface representation to provide an artifact-free surface visualization. I demonstrate and evaluate benefits of the proposed method with respect to surface accuracy and computational efficiency based on a number of benchmark data sets.

In the second part of my talk, I will give an overview Fusion Reaction Visualization, a joint project with the German Aerospace Centre and Aalto University in Finland. Fusion reactors have the potential to be a safe and sustainable energy source that could last almost indefinitely. One of the major obstacles is the lack of efficiency due to turbulence in the plasma, which leads to deterioration of the fusion reaction and loss of energy output. The goal of this project is to visualize turbulence in the plasma in order to support physicists in their research on identifying causes for turbulence and on determining optimal conditions for fusion reaction. We work with simulated data of a Tokamak reactor. I will give an overview of the state and limits of the simulation output, the current state of the project within these limitations, and I will give an outlook of how we plan to overcome them to provide valuable results.

Biography: Anne Berres holds B.Sc. and M.Sc. Degrees in Computer Science from the Technical University of Kaiserslautern and is currently a Ph.D. student in Computer Science at the Technical University of Kaiserslautern. Her research interests include topology, differential manifolds, differential geometry, medical visualization, neural diseases, and probablistic tractogrphy. She was the lead author of 'Tractography in Context: Multimodal Visualization of Probabilistic Tractograms in Anatomical Context' published in the Eurographics Workshop on Visual Computing for Biology and Medicine 2012.

For more information contact the technical host Curt Canada, cvc@lanl.gov, 665-7453.

Los Alamos NATIONAL LABORATORY EST.1943

Los Alamos Data Science at Scale Summer School

ISTI INFORMATION SCIENCE & TECHNOLOGY INSTITUTE